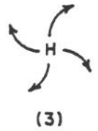
ATMOSPHERIC VARIABLES REVIEW #3 – ANSWERS

1. **(3) –** 

(3)

Surface winds associated with a high pressure center circulate clockwise and outward.

2. **(2) – winds converge and air rises**

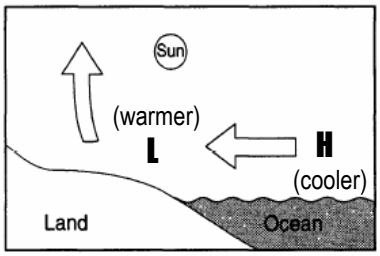
Areas of rainfall would coincide with low pressure. Winds in a low pressure system circulate counterclockwise and inward (converge). The "warmer" air associated with the low pressure area would rise up and eventually lead to cloud formation.

3. **(1) – an approaching storm**

Falling barometric pressure indicates that bad weather is coming (low = lousy). Humidity would increase, cloud cover would increase, and the chance for precipitation would increase.

4. **(3) – higher temperature an lower barometric pressure**

The diagram represents a sea breeze. During the day, t
Making the air pressure over the land warmer than over the ocean. This would create higher air pressure over the ocean and lower air pressure over the land.



5. **(3) –** 

As altitude increases, air pressure decreases.
(ESRT PAGE 14 – Properties of the Atmosphere chart)

6. **(3) – wind velocity**

Wind is always described in terms of both speed and direction.

7. **(3) – the Earth's rotation**

The deflection (bending) of winds is known as the Coriolis Effect, which is caused by the rotation of the Earth.

8. **(1) – decrease due to expansion**

As air rises (as in a low pressure center) to higher altitudes where the air pressure is less. The air expands and as a result becomes cooler. This is also known as adiabatic cooling (a temperature change resulting fro a change in pressure).

9. **(2) – increases**

Condensation will occur when the air becomes saturated (100% full). This occurs when the air temperature and dewpoint temperature reach the same value. Therefore, the closer the air temperature is to the dewpoint, the wetter the air is, and the better chance for condensation and precipitation.

10. **(4) – 20°C**

The dew point temperature is determined by the amount of water vapor in the air. As the amount of water vapor in the air increases, the dew point temperature increases. Therefore the most water vapor in the air would be indicated by the highest dewpoint temperature – in this case 20°C.

11. **(2) – 12°C**

According he diagram of the psychrometer, the following information can be gathered:
dry bulb = 20°C
wet bulb = 15°C
difference between wet and dry bulb = 5°C

Then, using the ESRT Dewpoint chart on page 12, go down to 20°C in the dry-bulb column and across to 5°C (the difference between wet and dry bulb – you should see that the dewpoint comes out to be 12°C.

12. **(3) – 33%**

This is a two chart question. You will need to use both the Dewpoint and Relative Humidity charts on page 12 of the ESRT. Using the dry bulb, go to the dewpoint chart and go across until you find 5°C. Then, go straight up to find the difference between wet and dry bulb that goes along with that data (in this case 9). Then using the dry bulb (still 22°C) and the difference just found (9), use the Relative Humidity chart to find the %RH – 33%.

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STEP 1

Dewpoint (°C)

Dry-Bulb Temperature (°C)	Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
−20	−20	−33														
−18	−18	−28														
−16	−16	−24														
−14	−14	−21	−36													
−12	−12	−18	−28													
−10	−10	−14	−22													
−8	−8	−12	−18	−29												
−6	−6	−10	−14	−22												
−4	−4	−7	−12	−17	−29											
−2	−2	−5	−8	−13	−20											
0	0	−3	−6	−9	−15	−24										
2	2	−1	−3	−6	−11	−17										
4	4	1	−1	−4	−7	−11	−19									
6	6	4	1	−1	−4	−7	−13	−21								
8	8	6	3	1	−2	−5	−9	−14								
10	10	8	6	4	1	−2	−5	−9	−14	−29						
12	12	10	8	6	4	1	−2	−5	−9	−16						
14	14	12	11	9	6	4	1	−2	−5	−10	−17					
16	16	14	13	11	9	7	4	1	−1	−6	−10	−17				
18	18	16	15	13	11	9	7	4	2	−2	−5	−10	−19			
20	20	19	17	15	14	12	10	7	4	2	−2	−5	−10	−19		
22	22	21	19	17	16	14	12	10	7	5	3	−1	−5	−10	−19	
24	24	23	21	20	18	16	14	12	10	8	6	2	−1	−5	−10	−18
26	26	25	23	22	20	18	17	15	13	11	9	6	3	0	−4	−9
28	28	27	25	24	22	21	19	17	16	14	11	9	7	4	1	−3
30	30	29	27	26	24	23	21	19	18	16	14	12	10	8	5	1

STEP 2

Relative Humidity (%)

Dry-Bulb Temperature (°C)	Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
−20	100	28														
−18	100	40														
−16	100	48														
−14	100	55	11													
−12	100	61	23													
−10	100	66	33													
−8	100	71	41	13												
−6	100	73	48	20												
−4	100	77	54	32	11											
−2	100	79	58	37	20	1										
0	100	81	63	45	28	11										
2	100	83	67	51	36	20	6									
4	100	85	70	56	42	27	14									
6	100	86	72	59	46	35	22	10								
8	100	87	74	62	51	39	28	17	6							
10	100	88	76	65	54	43	33	24	13	4						
12	100	88	78	67	57	48	38	28	19	10	2					
14	100	89	79	69	60	50	41	33	25	16	8	1				
16	100	90	80	71	62	54	45	37	29	21	14	7	1			
18	100	91	81	72	64	56	48	40	33	26	19	12	6			
20	100	91	82	74	66	58	51	44	36	30	23	17	11	5		
22	100	92	83	75	68	60	53	46	39	33	27	21	15	10	4	
24	100	92	84	76	69	62	55	49	42	36	30	25	20	14	9	4
26	100	92	85	77	70	64	57	51	45	39	34	28	23	18	13	9
28	100	93	86	78	71	65	59	53	47	42	36	31	26	21	17	12
30	100	93	86	79	72	66	61	55	49	44	39	34	29	25	20	16

13. **(1) – water evaporates from the skin**

Evaporation is a cooling process. When water evaporates, it takes heat from the surface it is evaporating from. When you sweat, beads of water form on the skin's surface. The water evaporates by taking heat from the skin's surface to turn from a liquid into a vapor. As a result, you feel cooler.

14. **(4) – water vapor**

Just read the chart – it says that water vapor has a mass of 18g – a number less than all the other gases listed. We also learned that water vapor is a relatively light gas compared to nitrogen and oxygen and other dry air molecules.

15. **(1) – lighter and less dense**

If heavy air molecules are removed and replaced with lighter water vapor molecules, the overall weight of the air will be less. The air would be "lighter" – another way to say this is saying that the air is less dense (it has less mass per unit volume).

16. **(3) – cooling temperatures and condensation**

Water vapor turning into a liquid is the definition of condensation. Condensation forms when the air cools to the dewpoint. (Energy must be released during condensation -ESRT page 1 – Properties of Water chart).

17. **(2) – saturated and contains condensation nuclei**

In order for condensation to form, first the air must be saturated (100% full of water vapor). Second, there needs to be a condensation surface for the water to cling to. In the air, dust particles (condensation nuclei) act as those surface.

18. **(3) – west to east**

The SW planetary winds (prevailing westerlies) push weather systems from the west to the east across the United States.